WFP

Western Forest Products Limited

Tree Farm License 25

Blocks 2 & 3

Loughborough Inlet and Naka Creek
Timber Emphasis
VRI Ground Sampling Plan

Submitted to:

Resource Inventory Branch
Ministry of Forests
Victoria, BC

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Executive Summary

This document provides detailed plans and rationale for the Vegetation Resources Inventory Phase II (Inventory) and Net Volume Adjustment Factor (NVAF) Sampling of Tree Farm Licence 25 Blocks 2 and 3.

The target population is the Vegetated Treed (VT) portion of TFL 25 blocks 2 and 3, excluding private lands, Parks and other legally recognized Protected Areas. Sample polygons were selected from the target population of 4,135 polygons using a stratified probability proportional to size with replacement (PPSWR) sampling technique. This population was reduced from the gross area by targeting only forested polygons with stands greater than or equal to 20 years old and by excluding low sites (<200 m^3/ha). Three strata were created based on grouping leading species, age class and total polygon volume from VRI Phase I Forest Cover Maps. Up to 100 VRI sample clusters will be established.

Net volume adjustment factor sampling will enhance up to 20 of the VRI sample clusters. To select NVAF sample plots VRI sample polygons were stratified by age class and leading species, based on VRI Phase I Forest Cover Polygons. All sampling will be completed in 2003. The estimated total cost of the VRI and NVAF are $217,500 collectively. These costs include installation of the VRI sample clusters and statistical analysis.

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Introduction

Block 2 is on the Mainland coast at the head of Loughborough Inlet. It has a total area of 66,891 ha of which 28,312 ha are productive and a THLB area of 15,002 ha. The THLB area is predominantly crown land with only 10 ha in private ownership. There are three sub-units to Block 2: Heydon Bay, Apple River and Fraser Bay/Stafford River. The THLB within the Heydon Bay and Apple River units are now mainly second growth originating from logging. The main community servicing this remote area is Campbell River.

Block 3 is on the east coast of Vancouver Island between Robson Bight and Eve River. It has a total area of 15,985 ha of which 12,852 ha are productive and a THLB area of 9,444 ha. The THLB is all Crown land. The nearest communities are Woss, Sayward and Campbell River.

The current forest inventory of TFL 25 Block's 2 and 3 were completed in 1971. Although this inventory has been regularly updated for denudations and regeneration, a new inventory was needed to reflect current second growth forest conditions.

The photo interpretation phase of the VRI project, based on 1996 photos for Block 2 and 1994 photos for block 3, was completed in 2002 and provides the bases for the ground sampling plot selection. Delineation and attribution of the photo interpretation was completed and a GIS product was created in 2002. Depletion since the photo date was updated into the VRI prior to ground sample selection.

Funding for this VRI/NVAF project comes from Western Forest Products' (WFP) agreement with Forest Investment Account (FIA). The project was initiated in 2002; it is expected to be complete in March 2004. This VRI Phase II Ground Sampling Plan provides the Vancouver Region of the Ministry of Forests (MOF, the Ministry) and the contractor, Kerley & Associates Forestry Consulting Ltd., with a detailed outline of sampling activities and objectives to be completed over the next year

TFL 25 Blocks 2 & 3 Landbase

Collectively these two blocks cover 82,876 ha of Crown land. The target population is the Vegetated Treed (VT) portion of the TFL, excluding private lands, parks and other officially protected areas. This area of interest (see Figure 2) encompasses 38,801 VT hectares (BC Land cover Classification Scheme). Excluding stands less than 20 years old and stands whose volume was less than 300 m^3/ha further reduced this area to 35,801 ha. The Phase I photo interpretation of forest cover will provide the basis of units to be sampled. The main tree species strata in Block 2 are Hw old 40%, Cw old 32% and Cw/Hw young 28%. Similarly in Block 3 the main tree species strata are Hw old 49%, Cw old 36% and Cw/Hw young 15%. Area by leading species for blocks two and three are reported below in tables one and two respectively.

Table 1. TFL 25 Block 2 Land Base.

Age Class	Hectares									%
	Ba	Cw	Dr	Fd	Hm	Hw	Ss	Yc	Total	
0-20		70	10		2	454			535	2.0%
21-40	35	525	446	15	2	2,267			3,291	12.4%
41-60	10	5	306			1,596			1,917	7.2%
61-80	7	39	23	53	1	637	2		763	2.9%
81-100	62	25			4	197	29	2	319	1.2%
101-120	17		2	28		19	9		75	0.3%
121-140	119	180			7	199	23		528	2.0%
141-250	2,081	3,438	5		684	3,578	41	1,311	11,137	42.1%
250+	348	3,429			810	3,056	16	258	7,917	29.9%
Total	2,679	7,712	791	96	1,511	12,003	120	1,571	26,482	
%	10.1%	29.1%	3.0%	0.4%	5.7%	45.3%	0.5%	5.9%		

Table 2. TFL 25 Block 3 Land Base.

Age Class	Hectares									%
	Ba	Cw	Dr	Fd	Hm	Hw	Ss	Yc	Total	
0-20		20		24		374			418	4.5%
21-40		29	4	10		604			647	6.9%
41-60									0	
61-80		2				43			45	0.5%
81-100	34	8	4			184			231	2.5%
101-120	8					46	7		61	0.7%
121-140	6					28			35	0.4%
141-250	376	1,165			536	2,661		1,593	6,332	67.9%
250+	96	415		1	12	834		193	1,550	16.6%
Total	521	1,640	9	35	547	4,775	7	1,786	9,319	
%	5.6%	17.6%	0.1%	0.4%	5.9%	51.2%	0.1%	19.2%		

Area of Interest

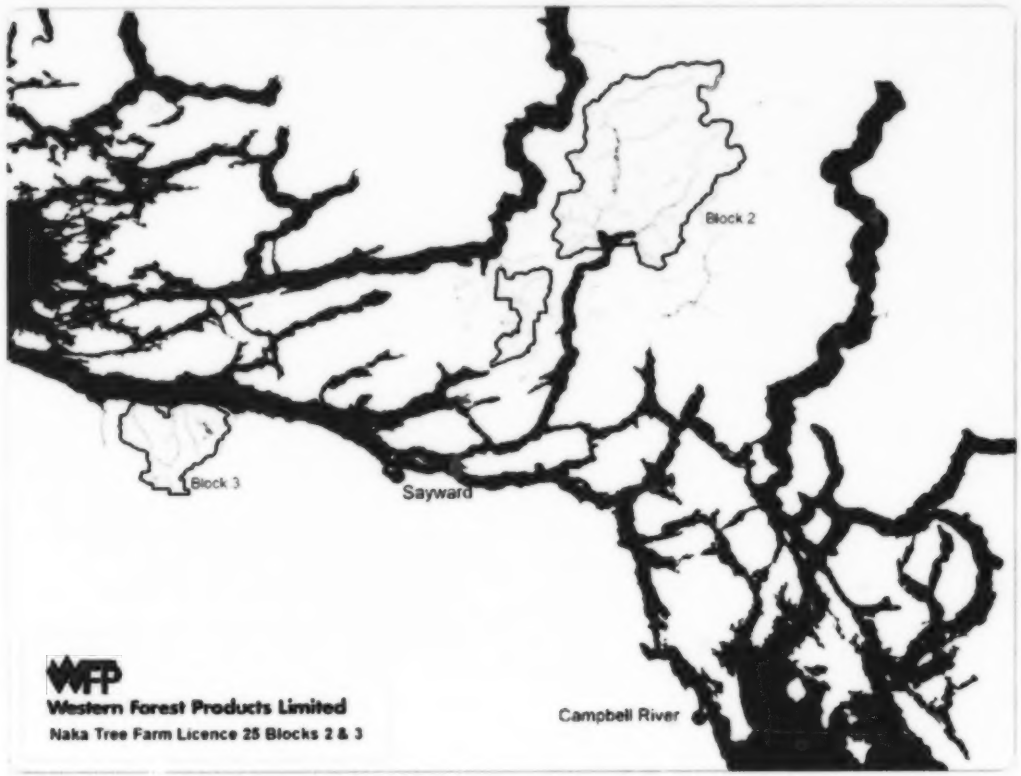


Figure 1: TFL 25 Blocks 2 & 3

VRI Phase II - Sampling Plan

Objectives

The main objective of this timber emphasis inventory is to:

> *Install a number of VRI sample clusters sufficient to adjust the timber inventory in the TFL Vegetated Treed (VT) areas with a sampling error of ±10% (95% probability) for overall net timber volume in the VT areas.*

Net timber volume is gross volume minus stumps, tops, decay, waste, and breakage. Decay and waste are normally estimated using VRI call grading/net factoring and NVAF sampling.

Sample Size

To meet the inventory objectives (section 2.3), a minimum sample size of 100 VRI sample clusters is recommended, with approximately 42 samples in the Hemlock old strata, 33 in the Cedar old strata, and 25 in the Cedar/Hemlock young strata (Figure 2, Table 2).

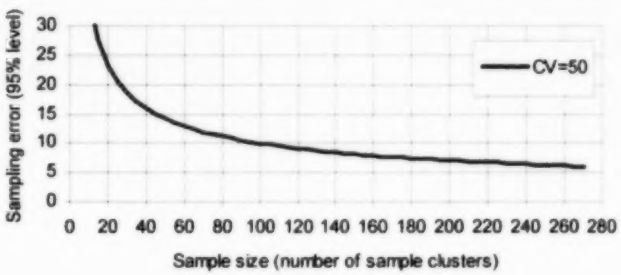


Figure 2. Decreasing sampling error with increasing sample size

Table 3. Sample cluster distribution in the VT land base.

Landbase	Area (%)	Number of clusters
Hemlock Strata (Hw, Ss, Ba, Hm, Fd)	**42%**	**42**
Cedar Strata (Cw, Yc, Dr, Pl, Mb)	**33%**	**33**
Cedar/Hemlock Young Strata (all)	**25%**	**25**
Total		**100**

Sample Selection

Sample polygons were selected according to the stratified probability proportional to size with replacement (PPSWR) sample selection method and the recently completed Phase I inventory. Appendix A fully outlines the steps in stratifying and selecting samples. Stratification was based on species groups, age groups and polygon productivity/volume groups. Selected samples are

summarized in Appendix B. Sample allocation to individual strata and substrata was proportional to strata or sub-strata areas. PPSWR was applied to each sub-stratum. Comparison of the VT population and the sample proportions is provided in Appendix C.

Given the exploded plot cluster design with 50m between the main plot and the auxiliary plots, and the detail of the forest cover typing in the TFL (large number of small polygons and/or irregular elongated polygons), the number of auxiliary plots falling outside the selected polygon is demonstrated to be in the order of 30% from past projects. In order to reduce this loss, the distance between the plot centre and auxiliary plot be reduced from 50m to 30m. This will allow maintenance of the provincial grid. Reducing cluster plots distances will lessen the number of plots dropped, improving logistic and sampling efficiency.

Net Volume Adjustment Factor Sampling (NVAF)

The VRI samples enhanced for NVAF measurements are identified in Appendix B. NVAF measurements will include detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimated net volume is obtained from net factoring and taper equations). Sixty trees (50 live, 10 dead) selected from 20 (15 in Block two and 5 in Block three) VT polygons (selected with at random from the Phase II sample clusters) will be selected in the VT target population and destructively sampled for NVAF. Of the 20 VT polygons, 15 have been selected from mature stands while 5 are from immature stands.

Measurements

The ground samples will be VRI Timber Emphasis (TE) sample clusters. Measurements will be based on the VRI Ground Sampling manual Version 4.3. The decision to do only TE sample clusters has been made, as detailed ecological classification was considered redundant since the entire TFL has been ecologically mapped in detail (to the site series).

The attributes to be sampled will be only those that can be used to adjust the Phase I classification variables. These are:

- Header Information – Card #1, Compass Card #2 & Cluster Layout Card #3 will be completed.
- Tree Details – Card #8 (Main Plot) Data Collected: species, diameter, length, crown class, height to green crown, grade, log length, sound wood percentage (net factor) and wildlife codes.

- Auxiliary Plot – Card # 11 (Auxiliary Plots – 4) Data Collected: species, DBH and all data as recorded on tree detail card for any species not recorded in the main plot. A separate card is completed for each of the four auxiliary plots.
- Tree Loss Indicators – Card # 9 Data Collected: Damage agents, loss indicators and stem mapping bearings and distances. The loss indicators are used in the Net Volume Adjustment sampling.
- Site Tree Data and Small Tree, Stump – Card # 10 Data Collected: Top height and random tree data – heights, ages, etc. This card also records small trees (less than 4cm at DBH) and stumps shorter than 1.3 metres in length.
- Coarse Woody Debris – Cards # 6 & 7 (Card #6 for transect 1 and Card # 7 for transect 2) Data Collected: species, diameter and transect measurements.
  Note: *Coarse Woody Debris data will only be collected where the plot is free from excessive snow and time permits. Plots where data cannot be collected* ***will not*** *be revisited.*

Cruiser Qualification and Quality Assurance

All cruisers are certified in timber measurements and inventory cruising through the Ministry of Forests Resource Inventory Branch and VRI programs. MOF certified cruisers will carry out the NVAF sampling.

The contractor, Kerley & Associates Forestry Consulting Ltd., will be responsible for field sampling quality assurance audits. A minimum of 10% of the samples will be checked with auditing occurring throughout the duration of the project.

Compilation

The MOF ground sample data entry system will be used. Compilation of the ground samples will be contracted out as compilation services are no longer offered by MOF.

Adjustment of Phase I Estimates

The ground samples will be post stratified into species groups by leading species. Where the number of plots is too small (probably < 6) in a stratum, strata will be combined in a logical manner keeping samples with similar ecological characteristics together.

Weighted totals for variables to be adjusted will be calculated for samples in each stratum. A similar computation will be carried out for Phase I estimates of each variable in the sampled polygons and a ratio formed between $Var_{phase\ II}/Var_{phase\ I} = R$ (adjustment ratio).

Schedule

The VRI will be implemented in 2003/04 as follows:

1. Select sample polygons (completed March 2003).
2. Select sample locations in polygons (completed March 2003).
3. Prepare sample packages (completed April 2003).
4. Select a random set of sub-samples for NVAF sampling (completed April 2003).
5. Locate and measure the sample clusters (April – September 2003, Kerley).
6. Sample NVAF sample clusters by Expert Cruiser (April – September 2003, Kerley).
7. Complete stem analysis (September - December 2003).
8. Validate and compile data from completed sample clusters and prepare inventory summary reports (January 2004).
9. Conduct statistical analysis and adjust inventory files (January 2004).

Roles and Responsibilities

Western Forest Products

- Select sample polygons and sample point locations.
- Coordinate project activities, and ensure all contractors are qualified and certified, tender and manage fieldwork contracts.
- Advise contractors on access routes and potential tie points.
- Check data after initial compilation.
- Complete database analysis.
- Prepare sample packages.

Kerley & Associates Forestry Consulting Ltd.

- Assess access and coordinate the use of helicopters.
- Complete field sampling.
- Conduct internal quality control.
- Enter sample data.
- Complete NVAF call grading/net factoring and destructive sampling.
- Validate and compile data.

Ministry of Forests, Vancouver Region

- Pre-numbered aluminum identity tags.
- Digital grid used for random sample location.
- Compilation of field samples from digital submission.
- Field tally cards.
- Review sample and population comparison.

Approximate Costs

Sample sizes and contract awarded rates for VRI and NVAF enhancements for TFL 25 Blocks 2 & 3 are listed in Table 4.

Table 4. Cost schedule for VRI and NVAF sampling for TFL 25 Blocks 2 & 3

VRI/NVAF Activity	Sample size (clusters)	Unit Cost($)	Total Cost ($)
Administration/Project Management			**9,500.00**
VRI Field Sampling	**100**	**1,460.00**	**146,000.00**
NVAF destructive sampling	**60 trees**	**666.67**	**40,000.00**
Quality Assurance			**5,000.00**
Data entry (VRI and NVAF)			**5,500.00**
GPS, Age Microscope Counts			**6,500.00**
Ratio Adjustment Analysis			**5,000.00**
Total			**217,500.00**

Appendix A – Sample Selection

The steps used to select ground samples to be used in the TFL 25 block's 2 & 3 VRI project are outlined below.

1. The database associated with the Phase I classification was checked for any anomalies.
2. A GIS overlay combining the VRI Phase I classification and ecosystem classification was completed so that immature polygons could be clustered into productivity groups.
3. A volume for individual mature polygons was calculated using VDYP to allow polygons to be clustered into volume groups.
4. The classification was partitioned based on the Land cover classification to include only Vegetated Treed polygons.
5. From the resulting list, polygons were stratified base on species groups and age. These groups combined all polygons into either a Hemlock old stratum, a Cedar old stratum or a Cedar/Hemlock young stratum. It was from this stratification that the sample distribution was defined.
6. The population was then broken into further stratums to reflect productivity. The table below reflects the breakdown:

Table 5. TFL 25 Block 2 Stratum Breakdown for Sample Selection

Species	Age	Site Class	Area (ha)	% Population	# of Samples	NVAF Samples
Cedar/Hemlock	Young	A	1,008	4%	3	1
		B	5,929	22%	17	3
		C	491	2%	1	0
Cedar/Hemlock Total			7,428	**28%**	**21**	**4**
Cedar	Old	High	2,834	11%	8	2
		Moderate	3,340	13%	9	2
		Low	2,267	9%	7	1
Cedar Total			8,440	**32%**	**24**	**5**
Hemlock	Old	High	4,561	17%	13	3
		Moderate	3,473	13%	10	2
		Low	2,580	10%	6	1
Hemlock Total			10,614	**40%**	**29**	**6**
Total			26,482		**74**	**15**

Table 6. TFL 25 Block 3 Stratum Breakdown for Sample Selection

Species	Age	Site Class	Area (ha)	% Population	# of Samples	NVAF Samples
Cedar/Hemlock	Young	A	66	1%	1	0
		B	1,204	13%	2	1
		C	167	2%	1	0
Cedar/Hemlock Total			1,437	15%	4	1
Cedar	Old	High	703	8%	2	0
		Moderate	1,379	15%	4	1
		Low	1,284	14%	3	1
Cedar Total			3,366	36%	9	2
Hemlock	Old	High	2,325	25%	6	1
		Moderate	1,507	16%	5	1
		Low	684	7%	2	0
Hemlock Total			4,516	48%	13	2
Total			9,319		26	5

7. Once each strata was defined the individual polygon areas beginning with the first polygon in the stratum to the last polygon in each stratum was accumulated.
8. As many random numbers as there were allocated samples for each stratum was generated. The random number ranged in size between 0 and the total area of each stratum.
9. The generated random numbers were used to identify the sample polygons. A polygon was selected if a generated random number was larger than the accumulated total area corresponding to the polygon immediately preceding it, and the random number was smaller than or equal to its accumulated area. A polygon had the potential to be selected more than once; however, this did not happen in this project.

Once the polygon selection for each stratum was completed the next step was the determination of a plot location within each polygon. This was done using the provincial-wide sampling 100 x 100m grid that coincides with the federal National Forest Inventory grid.

The steps in selecting the sample location within the polygon:

10. The 100 m grid was overlain on the Phase I polygons and a list made of all grid points falling within each polygon. Each grid point was given a unique ID.
11. A random point was selected within each sample polygon. This random selection was completed by counting up the total number of point within the polygon and then generating a random number between 0 and the total number of points found in the polygon.

The steps taken in selecting the ground samples that would be enhanced for NVAF are outlined:

12. Ground samples were stratified into the 3 strata using 120 years as the boundary between age groups.
13. It was then determined that 15 ground samples from the mature group would be selected for NVAF enhancement and 5 ground samples from the immature. **As a general rule, the number of ground samples needed equals the total number of sample trees divided by 3.** For example, if 60 live trees are required, then 20 ground samples should be selected.
14. Each age group strata was sorted by leading species.
15. Ground samples were selected systematically from each age group by calculating the selection interval by dividing the target number of ground samples by the number of samples in the age group. Generating a random number and multiplying this number by the selection interval determined a random start. The next ground sample in the sorted list was then selected for NVAF. The selection interval was then added to the random start and the next ground sample in the sort position was selected. The remaining ground samples were selected by continued adding of the selection interval to the selection number and so until the end of the sorted list of samples was reached.

Appendix B – List of Sample Polygons

Sample #	Block	Polygon #	Zone	UTM X	UTM Y	Flight line	Photo Numbers	NVAF	Leading Species	Mapsheet
1	2	4256	10	327816.99	5621705.33	10	214-216	NO	Hw	92K073
2	2	4104	10	333151.67	5622487.18	11	195, 196	YES	Dr	92K074
3	2	3082	10	327383.78	5628226.57	13	159-162	NO	Hw	92K073
4	2	5289	10	312388.49	5604027.46	3	308-310	NO	Cw	92K052
5	2	5278	10	313248.49	5605493.00	3	308-310	NO	Hw	92K052
6	2	5306	10	314416.29	5607146.08	4	302, 303	NO	Hw	92K052
7	2	5091	10	314984.89	5608823.59	5	291-293	NO	Hw	92K062
8	2	5076	10	312245.33	5610335.87	5	291-293	NO	Cw	92K062
9	2	5075	10	312820.18	5609712.18	5	291-293	NO	Hw	92K062
10	2	5027	10	313996.20	5611565.07	6	284, 285	YES	Hw	92K062
11	2	5008	10	314636.21	5612539.43	6	284, 285	NO	Hw	92K062
12	2	4833	10	311955.73	5613048.91	6	282, 283	YES	Cw	92K062
13	2	4375	10	329378.27	5620740.93	10	214-216	NO	Hw	92K073
14	2	4094	10	330438.48	5622198.22	10	214-216	NO	Hw	92K073
15	2	3905	10	321194.18	5623677.29	11	203, 204	NO	Hw	92K073
16	2	3692	10	334252.93	5624943.26	12	180-182	NO	Hw	92K074
17	2	3685	10	319037.48	5624766.04	11	205, 206	YES	Hw	92K073
18	2	3668	10	334856.33	5625018.55	12	180-182	NO	Hw	92K074
19	2	3481	10	328296.70	5626087.99	12	176, 177	NO	Hw	92K073
20	2	5443	10	341927.57	5631531.63	14	141, 142	NO	Hw	92K084
21	2	4169	10	323422.10	5621885.24	10	211, 212	NO	Hw	92K073
22	2	5143	10	314424.44	5607345.83	4	302, 303	NO	Cw	92K052
23	2	3944	10	333100.95	5623689.86	11	195, 196	NO	Cw	92K074
24	2	3736	10	337536.75	5624508.30	11	192, 193	YES	Cw	92K074
25	2	3609	10	327061.23	5625238.12	12	175, 176	NO	Cw	92K073
26	2	3399	10	325412.23	5626506.32	12	172, 173	NO	Cw	92K073
27	2	3286	10	326244.07	5627272.70	12	175, 176	YES	Cw	92K073
28	2	2320	10	327843.14	5632110.04	14	132, 133	NO	Cw	92K083
29	2	1976	10	326897.44	5633449.61	15	120, 121	NO	Cw	92K083
30	2	4792	10	310826.35	5614795.76	7	275, 276	NO	Cw	92K062
31	2	4050	10	332169.24	5622927.67	11	195, 196	NO	Cw	92K074
32	2	3856	10	325318.16	5624208.91	11	200 - 202	YES	Cw	92K073
33	2	3468	10	339387.95	5625732.91	12	184, 185	NO	Cw	92K074
34	2	3453	10	326099.18	5626178.02	12	174, 175	NO	Cw	92K073
35	2	3391	10	320913.12	5626590.42	12	170, 171	NO	Cw	92K073
36	2	3043	10	329173.59	5627953.09	13	159, 160	NO	Cw	92K073
37	2	1357	10	333658.57	5637274.75	17	74, 75	YES	Cw	92K084
38	2	851	10	326181.11	5640383.53	18	48, 49	NO	Cw	92K083
39	2	4025	10	323874.78	5623167.40	11	200 - 202	NO	Cw	92K073
40	2	3972	10	324082.73	5623359.00	11	200 - 202	YES	Cw	92K073
41	2	3767	10	318525.78	5624486.78	11	205, 206	NO	Yc	92K073
42	2	3370	10	329120.36	5626654.56	12	176, 177	NO	Cw	92K073
43	2	2227	10	323559.98	5632585.74	15	122, 123	NO	Yc	92K083
44	2	1972	10	327097.23	5633441.42	15	120, 121	NO	Cw	92K083
45	2	1782	10	326339.02	5634473.13	15	121, 122	NO	Cw	92K083
46	2	4221	10	327425.64	5621921.46	10	214 - 216	NO	Hw	92K073
47	2	4160	10	328628.32	5621972.25	10	214 - 216	NO	Hw	92K073
48	2	3637	10	327947.92	5624901.63	12	175, 176	YES	Hw	92K073
49	2	3537	10	322770.15	5625513.87	12	172, 173	NO	Hw	92K073
50	2	3546	10	318366.83	5625493.85	11	205, 206	NO	Hw	92K073

Sample #	Block	Polygon #	Zone	UTM X	UTM Y	Flight line	Photo Numbers	NVAF	Leading Species	Mapsheet
51	2	3475	10	318695.09	5626180.84	12	168, 169	NO	Hw	92K073
52	2	3291	10	329240.72	5627149.90	12	176, 177	NO	Hw	92K073
53	2	2941	10	327188.09	5628334.64	13	159 - 162	NO	Hw	92K073
54	2	2116	10	324583.48	5633144.19	15	122, 123	YES	Ba	92K083
55	2	943	10	326747.73	5639559.74	17	78 - 80	NO	Hw	92K083
56	2	1602	10	331295.36	5635770.77	16	89 - 91	NO	Ba	92K084
57	2	1519	10	331719.54	5636353.74	16	89 - 91	NO	Ba	92K084
58	2	1322	10	333874.78	5637666.12	17	74, 75	YES	Hw	92K084
59	2	5115	10	312467.64	5608425.99	4	299, 300	YES	Hw	92K052
60	2	4870	10	315783.78	5613693.16	7	271, 272	NO	Hw	92K062
61	2	3392	10	333515.34	5626474.31	12	179, 180	NO	Hw	92K074
62	2	3221	10	336145.14	5627166.79	12	180 - 182	NO	Ba	92K074
63	2	3012	10	326992.41	5628442.72	13	159 - 162	NO	Hw	92K073
64	2	2580	10	325975.47	5630485.56	14	130, 131	NO	Ba	92K073
65	2	2521	10	341012.16	5631169.06	14	141, 142	NO	Hw	92K084
66	2	2287	10	327647.45	5632218.12	14	132, 133	YES	Hw	92K083
67	2	1313	10	324767.71	5637639.57	17	80, 81	NO	Hw	92K083
68	2	1123	10	327410.15	5638631.96	17	78, 79	NO	Hw	92K083
69	2	5216	10	311842.13	5605350.21	3	308 - 310	NO	Hw	92K052
70	2	4606	10	331789.31	5618541.14	9	229 - 231	NO	Hw	92K064
71	2	3393	10	336020.65	5626571.58	12	180 - 182	NO	Hw	92K074
72	2	2859	10	337937.56	5629394.40	13	153, 154	NO	Hm	92K074
73	2	2740	10	338869.37	5630156.55	14	140 - 142	YES	Hw	92K084
74	2	5447	10	344437.05	5631728.53	14	144, 145	NO	Hw	92K084
1	3	41	9	689171.69	5595188.01	7	71, 72	NO	Ss	92L049
2	3	23	9	686563.06	5595381.96	7	69, 70	YES	Hw	92L049
3	3	153	9	683636.36	5593562.35	6	83, 84	NO	Hw	92L048
4	3	37	9	689471.28	5595200.20	7	71, 72	NO	Hw	92L049
5	3	1347	9	682392.39	5584809.98	3	5, 6	NO	Yc	92L038
6	3	1564	9	689378.78	5590095.11	5	37, 38	NO	Cw	92L049
7	3	1288	9	681797.36	5584685.74	3	5, 6	NO	Yc	92L038
8	3	1037	9	679446.11	5588390.58	4	34, 35	YES	Yc	92L048
9	3	587	9	681025.63	5591355.51	6	86, 87	NO	Yc	92L048
10	3	437	9	675592.75	5592134.19	6	90, 91	NO	Yc	92L048
11	3	970	9	680619.93	5589038.52	5	41, 42	NO	Yc	92L048
12	3	789	9	679760.07	5590503.77	5	41, 42	YES	Yc	92L048
13	3	138	9	677508.37	5594212.79	7	62, 63	NO	Cw	92L048
14	3	1019	9	689527.34	5588900.88	4	15, 16	NO	Hw	92L049
15	3	940	9	689735.17	5588709.28	4	15, 16	NO	Hw	92L049
16	3	152	9	677728.46	5593721.65	7	62, 63	YES	Hw	92L048
17	3	1556	9	680271.54	5590224.56	5	41, 42	NO	Hw	92L048
18	3	265	9	677053.90	5593094.00	6	89, 90	NO	Hw	92L048
19	3	303	9	678160.46	5592939.09	6	88, 89	NO	Hw	92L048
20	3	1018	9	682233.85	5588704.18	5	32, 33	NO	Ba	92L048
21	3	696	9	686945.64	5590896.38	5	35, 36	NO	Hw	92L049
22	3	493	9	680925.77	5591351.44	6	86, 87	NO	Hw	92L048
23	3	389	9	686413.84	5591674.93	6	82, 83	YES	Hw	92L049
24	3	273	9	679051.03	5593175.45	6	87 - 89	NO	Hw	92L048
25	3	814	9	678339.60	5588545.52	5	40, 41	NO	Hm	92L048
26	3	1520	9	684164.12	5592883.67	6	83, 84	NO	Hw	92L048

Figure 3. TFL 25 Block 2 Ground Sample Distribution

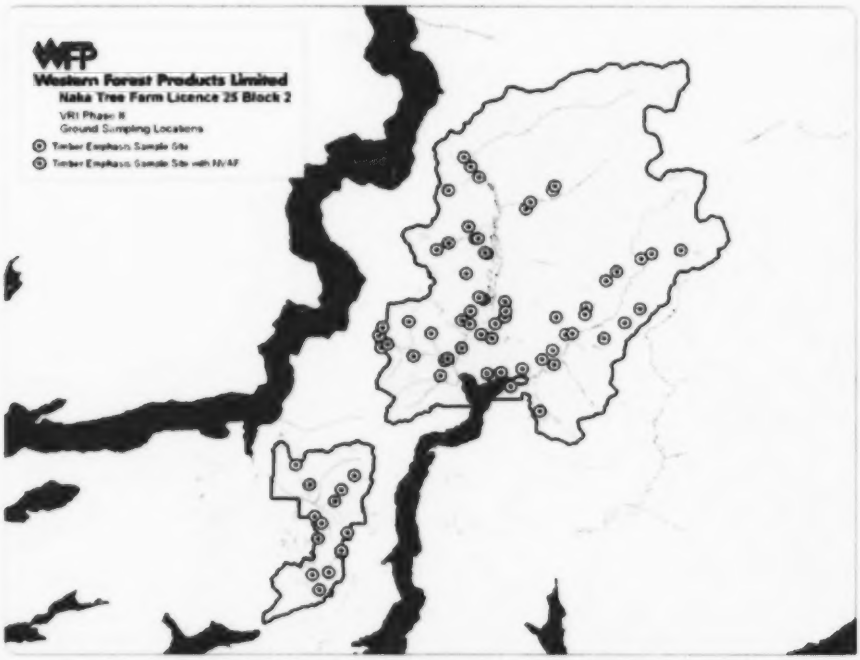
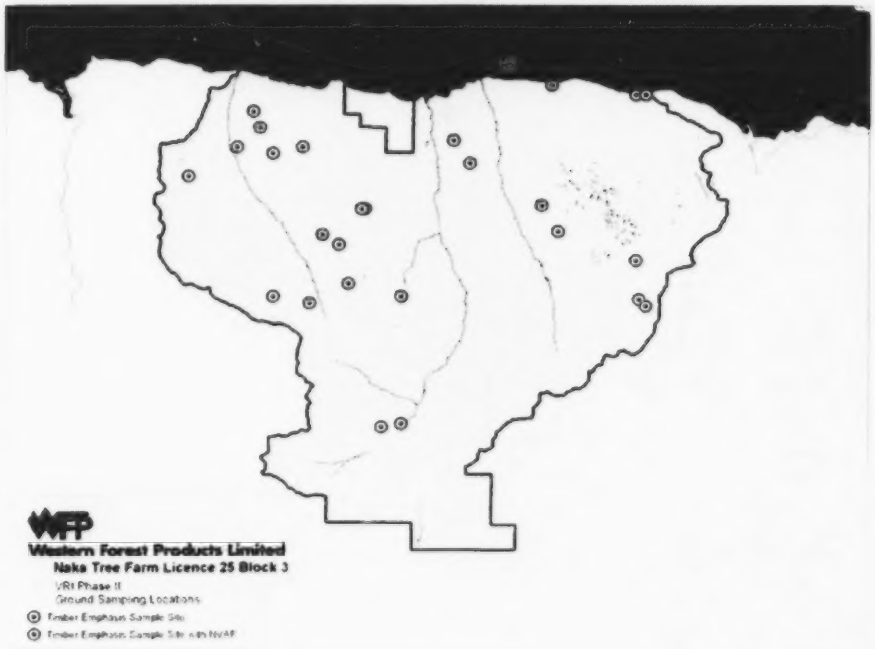

WFP
Western Forest Products Limited
Naka Tree Farm Licence 25 Block 2
VRI Phase II
Ground Sampling Locations
Timber Emphasis Sample Site
Timber Emphasis Sample Site with NVAF

Figure 4. TFL 25 Block 3 Ground Sample Distribution


WFP
Western Forest Products Limited
Naka Tree Farm Licence 25 Block 3
VRI Phase II
Ground Sampling Locations
Timber Emphasis Sample Site
Timber Emphasis Sample Site with NVAF

Appendix C – Comparison between the population and the sample polygons

The following graphs and table depict the comparison between population and sample percentage by Site Class, Age Class and Leading Species. The population values are area percentages, and the sample values are proportions of number of samples. The graphs and table suggests that the selected sample is representative of the Vegetated reed target population.

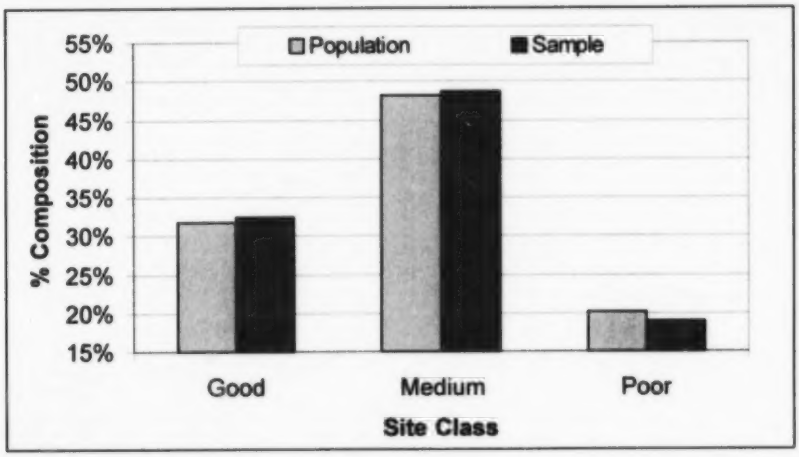


Figure 5. TFL 25 Block 2 Distribution of target and sample population by site index.

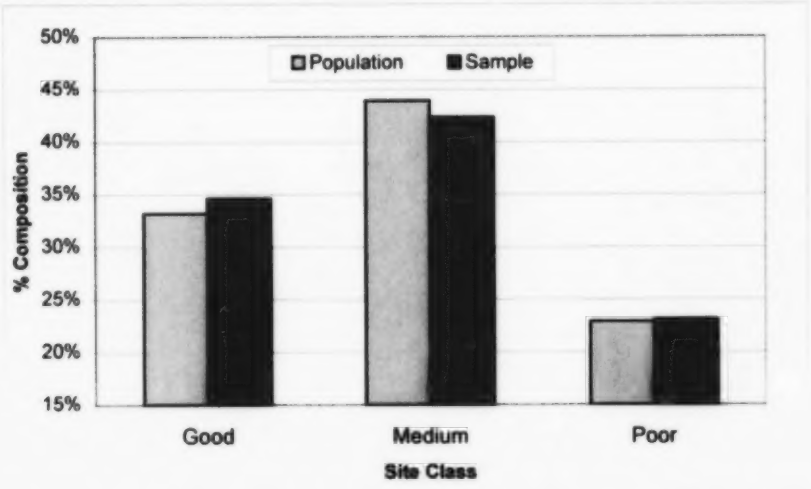


Figure 6. TFL 25 Block 3 Distribution of target and sample population by site index.

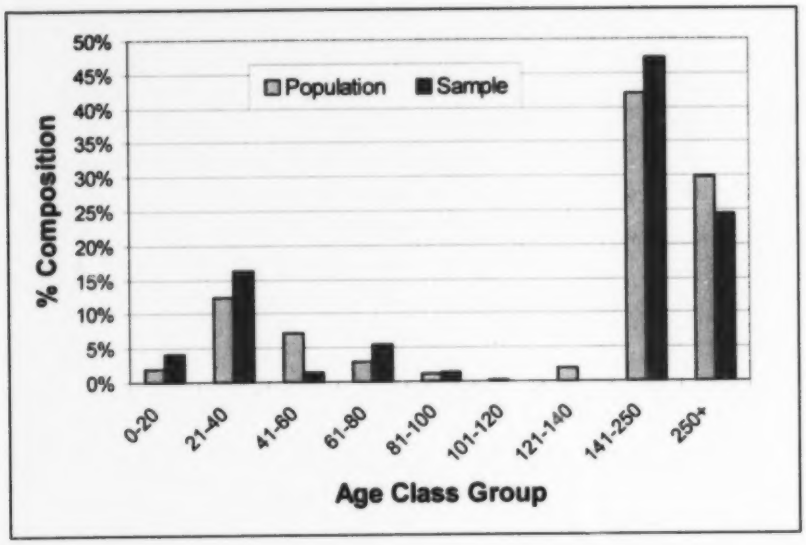


Figure 7. TFL 25 Block 2 Distribution of target and sample population by age class.

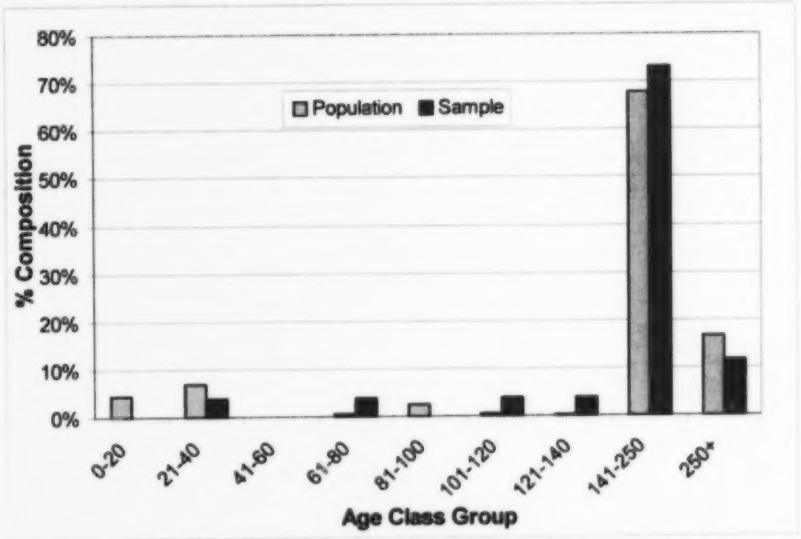


Figure 8. TFL 25 Block 3 Distribution of target and sample population by age class.

Table 7. Comparison of Population Area vs. Samples

Species Group	Age Group	Productivity	Population	Samples
Hemlock	Young	Good	9%	7%
		Medium	71%	70%
		Poor	21%	22%
	Young Total		40%	40%
	Old	High	27%	27%
		Low	53%	54%
		Moderate	20%	20%
	Old Total		60%	60%
Hemlock Total			**68%**	**68%**
Cedar	Young	Good	13%	25%
		Medium	32%	25%
		Poor	55%	50%
	Young Total		14%	13%
	Old	High	6%	7%
		Low	46%	46%
		Moderate	48%	46%
	Old Total		86%	88%
Cedar Total			**32%**	**32%**